#!/bin/bash

# Function to predict CPU usage using idle time

predict\_cpu\_usage() {

# Get CPU idle time from mpstat

idle=$(mpstat 1 1 | awk 'NR==4 {print $NF}')

# Calculate CPU usage percentage

cpu\_usage=$(echo "100 - $idle" | bc)

echo $cpu\_usage

}

# Function to toggle CPU cores based on predicted usage

toggle\_cpu\_cores() {

# we can adjust the threshold values

local threshold=30.0

local predicted\_usage=$(predict\_cpu\_usage)

local num\_on\_cores=$(nproc --all)

if (( $(echo "$predicted\_usage >= $threshold" | bc -l) )); then

echo "High predicted CPU usage. Turning ON all CPU cores."

sudo bash -c "echo 1 > /sys/devices/system/cpu/cpu\*/online"

else

echo "Low predicted CPU usage. Turning OFF all CPU cores except the first one."

sudo bash -c "echo 0 > /sys/devices/system/cpu/cpu{1..$(($(nproc --all) - 1))}/online"

num\_on\_cores=1

fi

# Print number of online and offline CPUs

online\_cpus=$(grep -c '1$' /sys/devices/system/cpu/cpu\*/online)

offline\_cpus=$(grep -c '0$' /sys/devices/system/cpu/cpu\*/online)

echo "Online CPUs: $online\_cpus, Offline CPUs: $offline\_cpus"

echo $num\_on\_cores

}

# Function to calculate energy consumption

calculate\_energy\_consumption() {

local power=$1

local time\_interval=$2

# Define a conversion factor based on your system's power characteristics

# This factor represents the relationship between power and energy consumption

# Modify this factor based on empirical measurements or system specifications

local conversion\_factor=0.002 # Adjust this value based on observed behavior

# Calculate energy consumption using the conversion factor

energy\_consumption=$(echo "$power \* $time\_interval \* $conversion\_factor" | bc)

echo $energy\_consumption

}

# Main loop

while true; do

# Toggle CPU cores based on predicted usage

num\_on\_cores=$(toggle\_cpu\_cores)

# Get CPU power consumption

power=$(mpstat 1 1 | awk '$12 ~ /[0-9.]+/ {print 1 - $12}')

# Calculate energy consumption over the interval

time\_interval=5 # Adjust the time interval as needed

energy\_consumption=$(calculate\_energy\_consumption $power $time\_interval)

# Display number of online and offline CPUs

# Count total CPUs

total\_cpus=$(grep -c 'processor' /proc/cpuinfo)

# Calculate online CPUs

online\_cpus=$(cat /sys/devices/system/cpu/online | awk -F'-' '{print $2 - $1 + 1}')

echo "Online CPUs: $online\_cpus"

# Display predicted CPU usage and estimated energy consumption

echo "Predicted CPU Usage: $(predict\_cpu\_usage)%"

echo "Estimated Energy Consumption: $energy\_consumption joules"

done